TraumaRegister DGU®
DEUTSCHE GESELLSCHAFT FÜR UNFALLCHIRURGIE

German Trauma Society (DGU)

Committee on Emergency Medicine, Intensive Care and Trauma Management (Section NIS)

and AUC - Academy of Trauma Surgery

TraumaRegister DGU®

Annual Report 2013

with data until 2012

TraumaRegister DGU®

DGU Registry of Sektion NIS

Preface

Dear Participant,

we proudly present the **Annual Quality Report 2013** of the TraumaRegister DGU® for your hospital. This report includes all severely injured cases admitted to your hospital until the end of 2012, whose documentation has been completed until February 2013.

20 Years - Happy Birthday TraumaRegister DGU®

Since **20 years** now data from severely injured patients were documented in this registry. From year to year the number of participating hospital increased and made this registry to one of the few large trauma registries in the world. This is why we would like to express our deep gratitude to all active participants, also in the name of our scientific society, the DGU (German Trauma Society).

Last year, the **number of participating hospitals** could again be increased (n=572); for the first time also with hospitals from Finland and China. The number of documented **patients** (n=28,805 in 2012) is also higher than in the year before. The total number of cases documented in the TraumaRegister DGU® is now 122,672, of which 91% have been collected since the introduction of the online documentation software in 2002. In 2012, about half of all patients (48%) were documented with the standard dataset, the rest with the reduced QM dataset (available only for hospitals within TraumaNetzwerk DGU®). Every tenth case was a patient treated in a hospital outside Germany.

The ever increasing number of patients also had an effect on the presentation of the results. Now most comparisons were not made with the whole registry but only with the **recent 10 years**. In next year's report the main instrument for outcome adjustment will be the new **RISC II** score, since the original **RISC** is based on data from the 1990s. The observed mortality is actually about 1-2% lower than the RISC prognosis. First results of the new RISC II are presented on page 7.2.

Although there is a positive trend towards an increasing **data quality**, we would like to emphasize this topic here again. The results of the TraumaRegister DGU®, both audit reports and publications, could be only as good as it's data quality. You will find completeness rates for some important variables on page 8. It must be our aim to reach a completeness rate of >95% here, even if there is still much room for improvement for some variables. The high standard of data quality has become one of the international recognized properties of the TraumaRegister DGU®. But we need your help to keep this standard!

In 2012 and 2013 there were again a lot of new **scientific publications** with data from the TraumaRegister DGU®. You find a list of references in the appendix of the report (PDF available on request). A complete list of publications is available at our homepage *www.traumaregister.de*.

Kindest regards

Rolf Lefering Thomas Paffrath Ulrike Nienaber

Sektion NIS of DGU – Working Group TraumaRegister and AUC - Akademie der Unfallchirurgie GmbH

Content

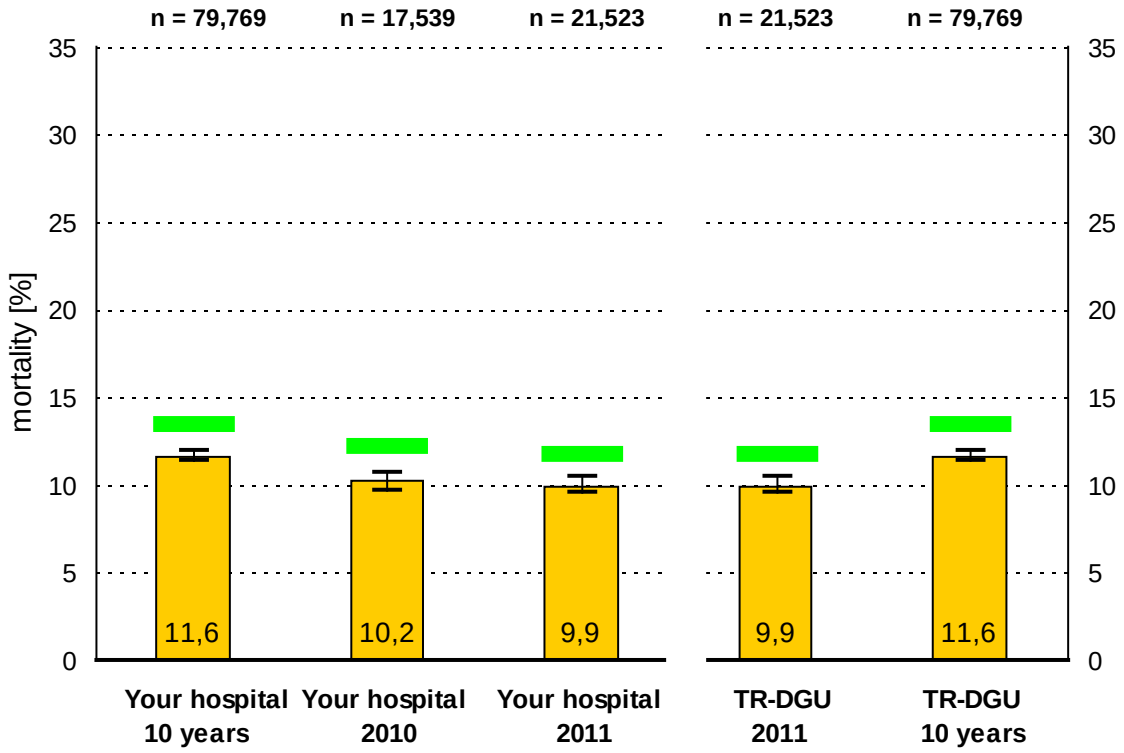
1. Observed Mortality and Prognosis

Comparing the **observed mortality** of severely injured trauma patients with their **prognosis** is a central element of quality assessment using the TraumaRegister DGU®. Here the prognosis is derived from a prognostic score called **RISC** (Revised Injury Severity Classification) which has been developed an validated with data from this registry. Details of the RISC could be found on page 7.

The **total number** of patients documented from your hospital is: n = **122,742**
- among these, documented in the **recent 10 years** (2003-12) n = **108,986**
- among these, documented last year (**2012**): n = **28,805**

P**rimary patients** are those who were not transferred in from another hospital (n=2428), nor were they transferred out within 48 hours (n=1887). In 2012, the rate of primary patients was **85%**: n = **24,490**
Among these, **88%** had sufficient data to calculate a RISC prognosis: n = **21,523**

The average age of these 21,523 patients was 47,1 years, and 71% of them were males. The mean ISS was 17,0 points. Of these patients 2140 died in hospital **9,9%** (95% confidence intervall: 9,5 - 10,4). The risk of death prognosis based on RISC was **11,7%**. You find these values in the figure below, where also your hospital results from previous years are presented together with the overall result in the registry.



Legend to the figure:

The yellow bars represent the observed mortality rate; percentages are given at the bottom of each bar. The predicted mortality rate based on RISC is given as a bold vertical bar in green or red. This bar is **green** in case that the observed mortality is lower (i.e., better) than expected, and it is **red** otherwise.

The interpretation of these results has to consider that these findings depend on statistical uncertainty. Therefore, the 95% confidence interval for the observed mortality rate is given as well (***vertical line***). The confidence interval describes a range of values which cover the true value with a high probability (95%). The more patients a value is based on, the narrower the confidence interval. In case that the expected prognosis lies outside the confidence interval, it could be interpreted as a significant deviation ($p<0,05$).

If the observed mortality rate is based on ***less than 5 cases***, no confidence interval will be presented.

2, Basic data from the last 3 years

Attention: Results have to be interpreted with caution when the number of patients is low!

	Your Hospital				TraumaRegister DGU®	
	10 years	2010	2011	**2012**	2012	10 yerars
Total no. of patients [n]	12,2742	16,874	24,312	**28,805**	28,805	122,742
Primary adm. + treated [n]	91,341	14,224	20,449	**24,490**	24,490	91,341
Early transferred out [n]	5,760	10,59	1,633	**1,887**	1,887	5,760
All primary admissions [n]	97,101	15,283	22,082	**26,377**	26,377	97,101
From other hospital [n]	11,885	1,591	2,230	**2,428**	2,428	11,885
Patients:						
Age [years]	45.9	46.4	47.1	**47.6**	47.6	45.9
Male patients [%]	71%	71%	71%	**70%**	70%	71%
Trauma:						
Blunt trauma [%]	95%	96%	95%	**95%**	95%	95%
ISS [MW]	19.3	18.8	18.3	**17.0**	17.0	19.3
ISS ≥ 16 [%]	57%	55%	53%	**48%**	48%	57%
Head injury (AIS head ≥ 3) [%]	38%	36%	35%	**32%**	32%	38%
Pre-hospital Care (only primary admissions):						
Intubation [%]	33%	30%	26%	**23%**	23%	33%
Unconscious (GCS ≤ 8) [%]	21%	20%	17%	**17%**	17%	17%
Shock (BP ≤ 90 mmHg) [%]	13%	13%	12%	**10%**	12%	10%
Avg, amount of volume [ml]	874	816	755	**698**	698	874
Shock Room / ER (only primary admissions):						
Whole body CT [%]	65%	70%	71%	**71%**	71%	65%
X-ray of thorax [%]	52%	50%	46%	**44%**	44%	52%
Blood transfusion [%]	13%	11%	9%	**9%**	9%	13%
Treatment in the Hospital:						
Operated patients [1) 4)] [%]	73%	69%	71%	**69%**	69%	73%
No. of operations [1) 4)] [MW]	3.7	3.5	3.8	**3.6**	3.6	3.7
Intensive care unit [%]	81%	79%	79%	**78%**	78%	81%
LOS on ICU [2)] [days]	8.3	8.0	7.2	**6.8**	6.8	8.3
Intubated/ventilated [2)] [%]	56%	53%	48%	**45%**	45%	56%
Days intubated [2)] [days]	4.6	4.3	3.6	**3.3**	3.3	4.6
Outcome:						
LOS in hospital[3)] [days]	19.2	18.2	17.0	**16.2**	16.2	19.2
Hospital mortality [3)] [%]	11.6%	11.4%	10.2%	**10.0%**	10.0%	11.6%
Early mortality (<24 h) [3)][%]	5.9%	6.1%	5.3%	**4.7%**	4.7%	5.9%
Organ failure [1) 3)] [%]	39%	40%	37%	**36%**	36%	39%
Discharge to other hosp. [%]	17%	17%	16%	**16%**	16%	17%

LOS = Length of Stay ICU = Intensive Care Unit ISS = Injury Severity Score CT = Computed Tomography
[1)] not available in the reduced QM dataset [2)] only ICU patients [3)] without patients transferred out early [4)] Hospitals with incomplete documentation excluded

3. Quality Indicators

The results on this page only refer to primary admitted cases or subgroups thereof.

For the calculation of the time from hospital admission until various diagnostic procedures, only patients with a valid time were considered (see also remarks below). A standard deviation (SD) is presented only if more than one value was available.

	Your Hospital				TR-DGU	
Indicator	10 years	2010	2011	**2012**	2012	10 years
Primary admitted patients	n=97,101	n=15,283	n=22,082	n=26,377	n=26,377	n=97,101
1. Pre-hospital time from the accident until hospital admission; in patients with ISS ≥ 16 [∅ min ± SD]	**71** ± 50 n=45466	**72** ± 53 n=6771	**71** ± 54 n=9463	**70** ± 52 n=10414	**70** ± 52 n=10,414	**71** ± 50 n=45,466
2. Intubation rate of unconscious patients (GCS ≤ 8) [%, n / total]	**88%** 16431 / 18618	**88%** 2474 / 2814	**86%** 3035 / 3548	**84%** 3394 / 4045	**84%** 3394 / 4045	**88%** 16.431 / 18.618
3. Time from hospital admission until **first x-ray of the thorax**; in patients with ISS ≥ 16 [∅ min ± SD]	**13** ± 19 n=22818	**12** ± 16 n=3391	**15** ± 20 n=4418	**16** ± 22 n=4750	**16** ± 22 n=4,750	**13** ± 19 n=22,218
4. Time from hospital admission until first **x-ray of the pelvis**; in patients with ISS ≥ 16 [∅ min ± SD]	**15** ± 18 n=16113	**13** ± 14 n=2383	**16** ± 19 n=3051	**17** ± 21 n=3184	**17** ± 21 n=3,184	**15** ± 18 n=16,113
5. Time from hospital admission until **abdominal sonography** (FAST); in patients with ISS ≥ 16 [∅ min ± SD]	**7** ± 11 n=36311	**7** ± 11 n=5480	**7** ± 11 n=7898	**7** ± 11 n=8877	**7** ± 11 n=8,877	**7** ± 11 n=36,311
6. Time from hospital admission until **CT of the head** (cCT); in patients with GCS < 15 [∅ min ± SD]	**24** ± 18 n=36758	**23** ± 17 n=5678	**23** ± 18 n=8081	**23** ± 17 n=9604	**23** ± 17 n=9,604	**24** ± 18 n=36,758
7. Time from hospital admission until **whole-body CT** (WBCT); in all patients [∅ min ± SD]	**24** ± 18 n=55892	**24** ± 17 n=9484	**24** ± 19 n=14075	**24** ± 18 n=17673	**24** ± 18 n=17,673	**24** ± 18 n=55,892
8. Time from hospital admission until first **emergency surgery**; for selected interventions (see remarks below) [∅ min ± SD]	**81** ± 41 n=10910	**78** ± 41 n=2009	**77** ± 41 n=3265	**87** ± 39 n=3998	**87** ± 39 n=3,998	**81** ± 41 n=10,910

Renarks: ∅ = average

Indicator 1: Times exceeding 8 hours were disregarded.

Indicator 3-8: Times exceeding 3 hours were disregarded.

Indicator 6: If a whole-body CT was performed, it was counted here as well.

Indicator 8 is based on the following seven interventions: craniotomy, thoracotomy, laparotomy, revascularization, embolization, external stabilization of the pelvis or of extremities

4. Individual Cases

Here patients are listed who **died** in hospital although their initial prognosis (based on the RISC score) seemed to be rather low (Section **4.a**). In total, 209 such cases were observed in the whole registry for the year 2012. A low risk of death does not mean that none of these patients would die, however, this does not happen very often. Therefore, a detailed analysis of such cases may lead to **relevant problems** during the acute care of this patient. But this could only be clarified in a more detailed individual analysis of these cases.

In the second section (**4.b**) patients are listed who survived although their risk of death was rather high (>80%). Last year, this has been observed in 131 cases in the whole registry. Patients transferred into another hospital whithin the first two days were disregarded here, of course. Nevertheless, patients could have been transferred later and survival might not have been secured. But such cases could also be an indicator for a very well functioning **interdisciplinary cooperation** in acute care. Again, details could only be found after individual analysis of the case.

The present analysis only considered primary admitted cases (no transfers in; no early transfers out) who had enough data to calculate the RISC score. Among the total number of **28805** patients documented from your hospital last year, this applies to **21523 patients** (75%). For completeness of data regarding the RISC score, see page 7 in this report.

4.a) Died with a low risk of death (< 10% acc. to RISC)

Among the 21523 primary admitted cases with a RISC prognosis, **16242** patients had a risk of death < 10%.

Those patients who **died** from this group (**n = 209**) are listed in the table below.

ID in the registry*	RISC	ISS	Age	Sex	Admission date	LOS
D-XXXXX@2012-0001.n	7.0	29	50	M	18.08.2012	3

4.b) Survived with a high risk of death (> 80% acc. to RISC)

Among the primary cases with a RISC prognosis, **879** patients had a risk of death > 80%.

Those patients who **survived** from this group (**n = 131**) are listed in the table below.

ID in the registry*	RISC	ISS	Age	Sex	Admission date	LOS

* The ID in the registry is composed of the hospital code, the year of trauma, and the individual patient code
LOS = length of stay in hospital (days)

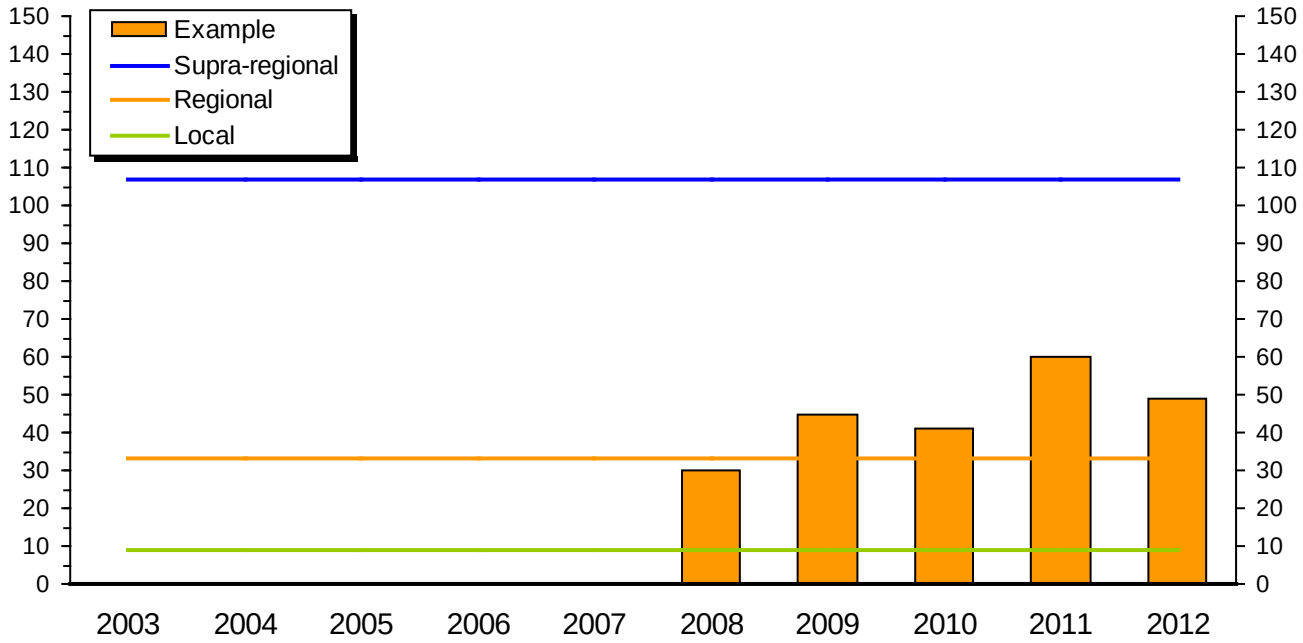
5. Graphical Comparisons

5.1 Development in the last 10 years

The following graph shows the development of case numbers in the last ten years. The total number of documented cases from your hospital was **122,742 patients** in **20 years**. In the figure below, we **excluded** all patients who neither had an injury severity score of at least 9 points, nor were treated on an intensive care unit. For your hospital, this leaves **n=100.587 of 108,986** patients in the last 10 years, and **n=25,830 of 28,805** patients in the actual year 2012.

In order to compare your case numbers with that of other hospitals in the registry, we calculated the average number of documented cases per year for each level of care (horizontal lines): supra-regional trauma centers (level 1) n=107 / regional trauma centers (level 2) n=33 / local trauma centers (level 3) n=9. For calculating these values annual case numbers <20 and <5 for level 1 and 2 hospitals, respectively, were disregarded. The colour of the bars indicates the level of care of your hospital **(Regional Trauma Center, level 2)**.

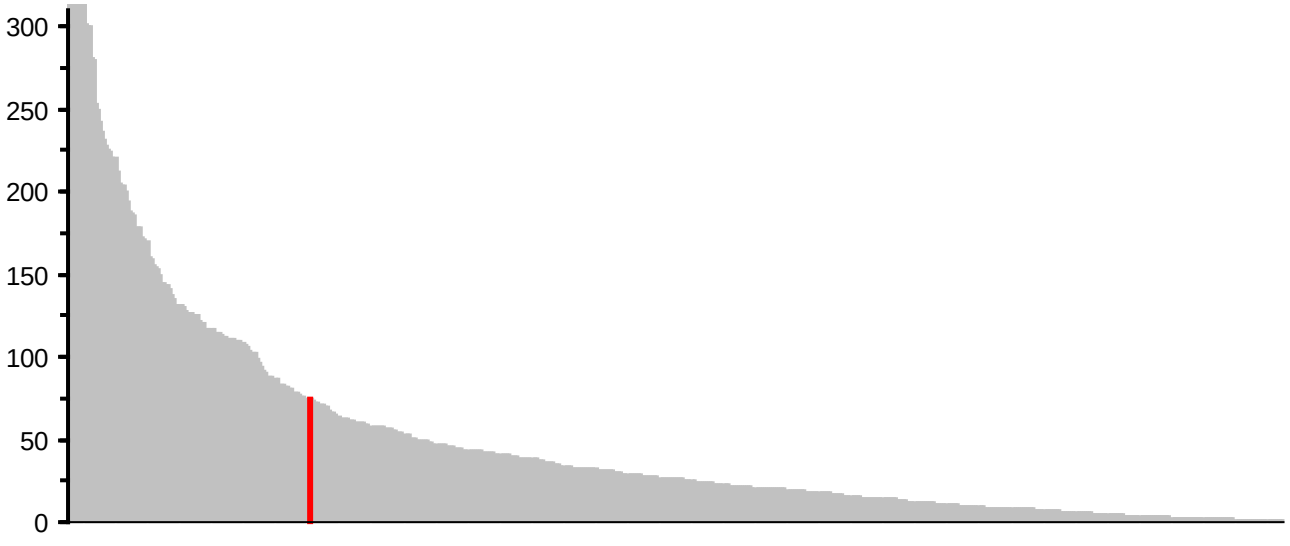
If the number of cases of your hospital lie below the average number of similar hospitals in the registry (same level of care), then an incomplete documentation of all potential patients might be one of the reasons for this.



5.2 Number of Patients in 2012

Your hospital: **n =28,805;** TR-DGU: n = 28,805

The total number of documented patients from your hospital (all years) was **122,742;** this represents a portion of **100%** from all patients in the TR-DGU. The case number of your hospital is highlighted in **red** in the figure below.



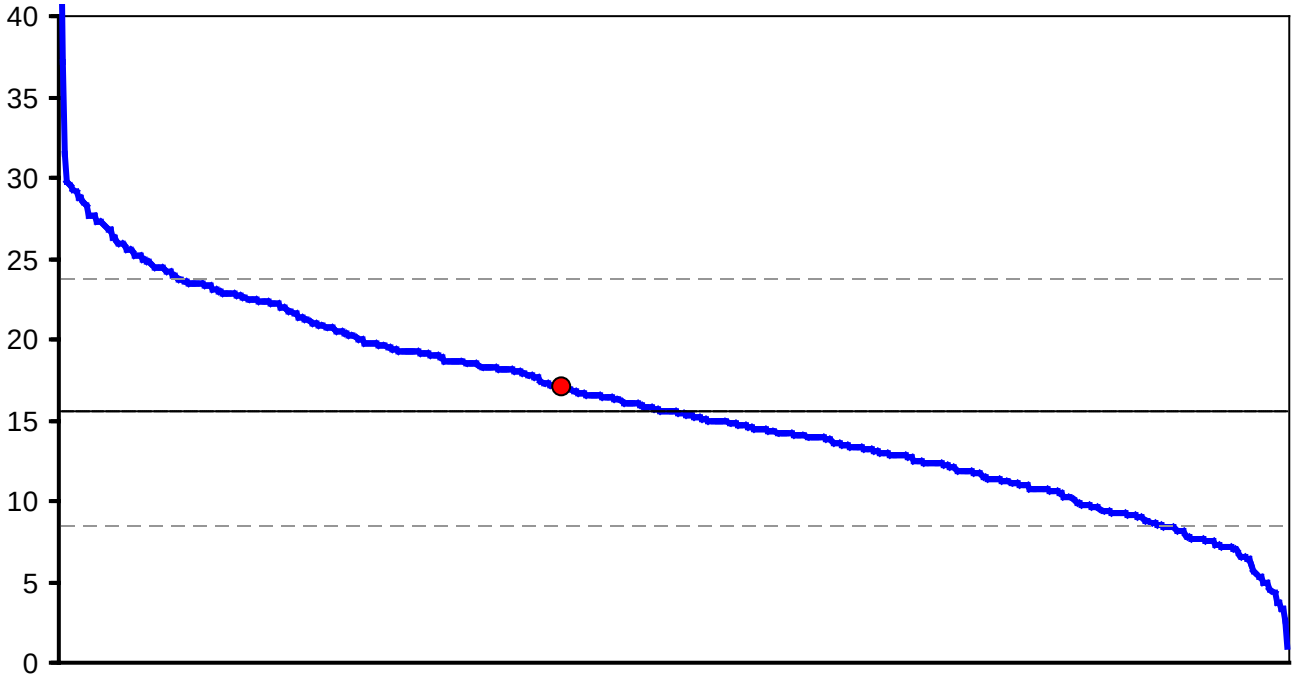
Graphical Comparisons with other Hospitals in 2012

The following figures are based on data from the year **2012** only. All hospital values are sorted and compared with the overall result in the registry. Your hospital is marked with a **red dot** in the figures, if there are **at least 3 patients** with valid data (your hospital: n=28,805). The horizontal line represents the median value of all hospitals included in the figure, and the broken lines represent the 10% and 90% percentiles. TR-DGU indicated the mean value of all patients in 2012.

Mean ISS (Injury Severity Score)

Your Hospital: **17.0 points**; TR-DGU: 17.0 points

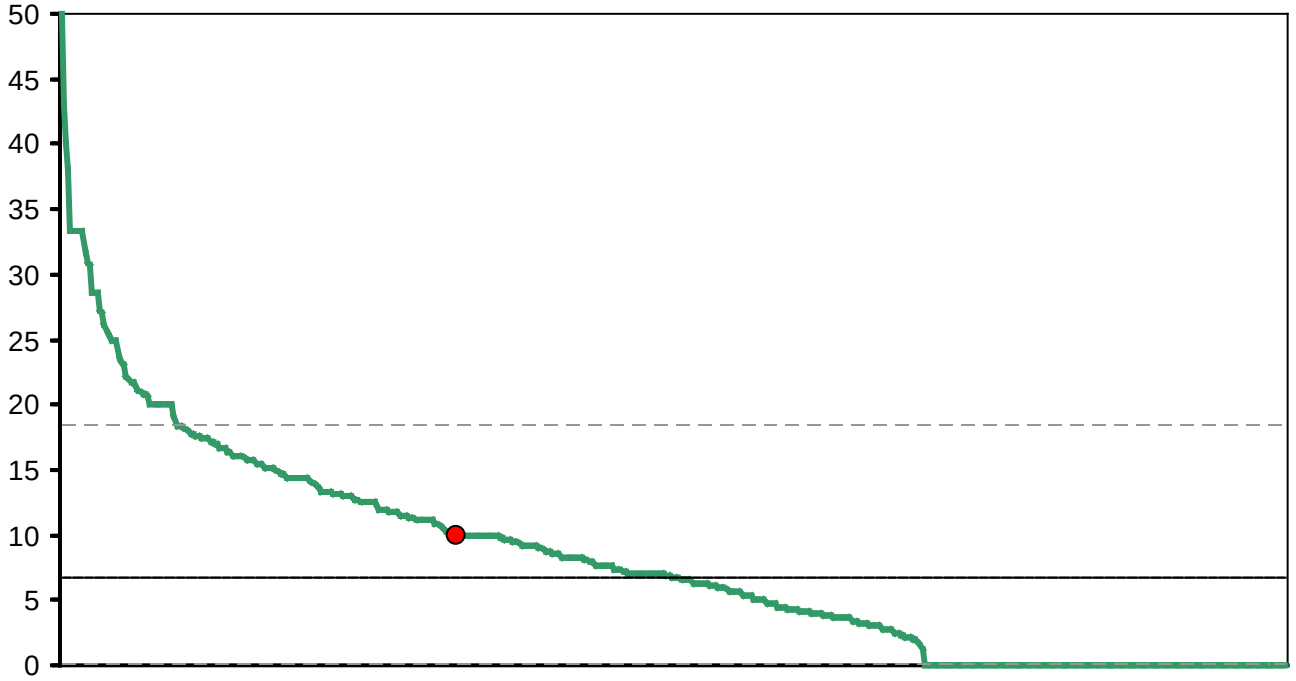
Your hospital value is based on **28,805** patients from 2012.



Hospital Mortality (%)

Your hospital: **10.0%** (2,679 of 26,918); TR-DGU: 10.0%

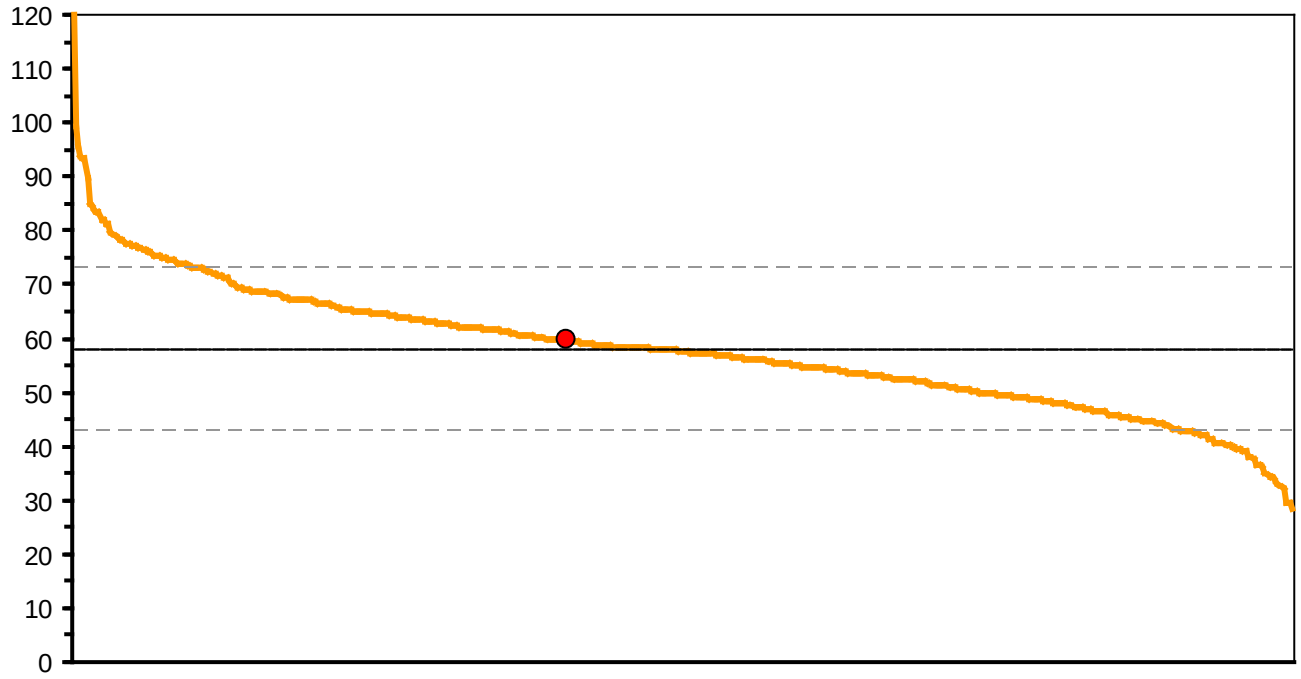
Only pimary admitted patients and those transferred in; patients transferred out within 48 hours were excluded here. If there were less than 3 cases from your hospital, then your hospital value was not included in this figure.



Pre-hospital Time from accident to hospital admission (Min.)

Your hospital: **59.7 Min.**; TR-DGU: 59.7 Min.

The mean value of your hospital is based on **21,839** (out of 26,377) **primary admitted patients** with valid time data for both the accident and the hospital admission. If there were less than 3 cases with valid data, then your hospital was not included in this figure.

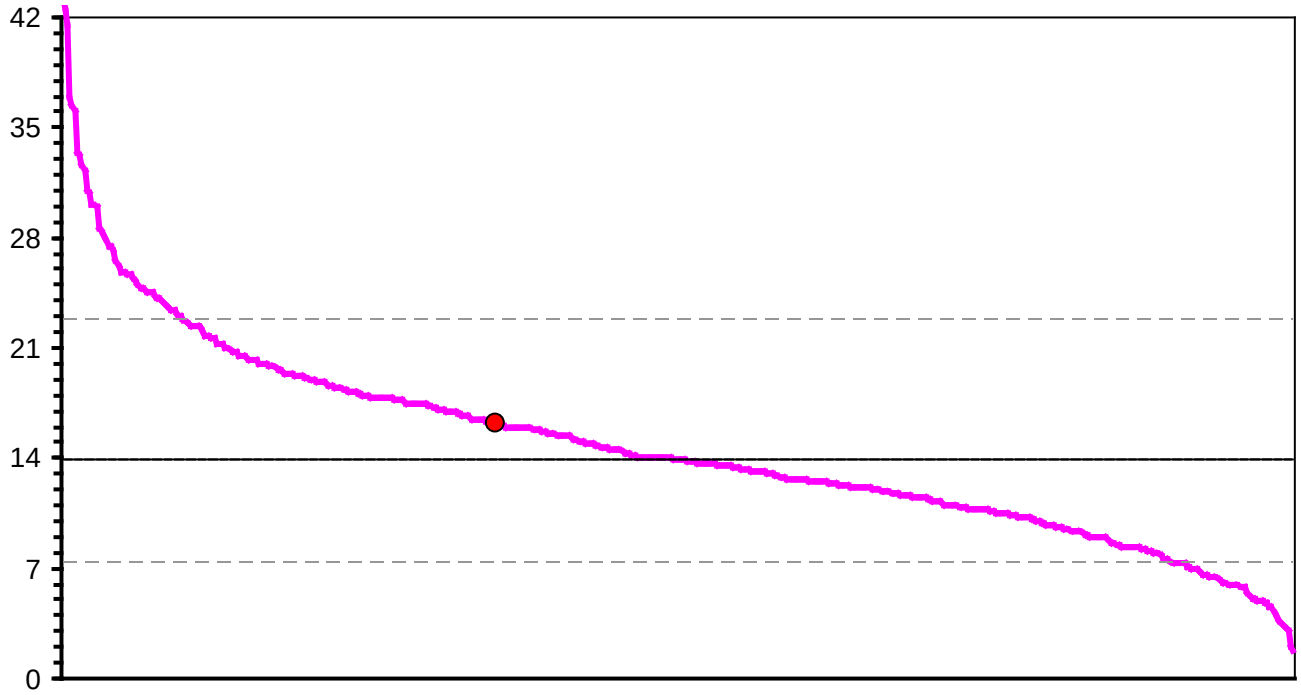


Length of Stay in Hospital (days)

Your hospital: **16.2 days**; TR-DGU: 16.2 days

Patients transferred out within 48 h were (n=1,887) were **not** included here.

The mean value of your hospital is based on **26,918 patients;** 2,216 patients (**9%**) were transferred to another hospital at the end of their stay. If there were less than 3 cases with valid data, then your hospital was not included in this figure.



Length of Stay and Injury Severity

This figure describes the association of **length of stay** (LOS) in hospital and **injury severity** (ISS). The mean values were calculated for survivors only. Patients transferred into another hospital (n=4103) were also excluded. Hospitals with **less than 3 patients** were **not included** in this figure.

■ Your Hospital 2012:

The results of your hospital are based on **22,023 patients.**

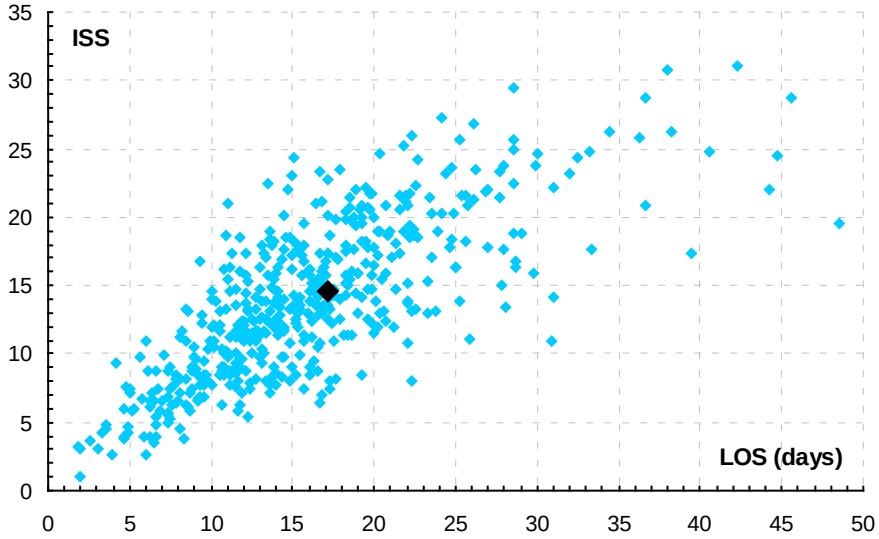
LOS in hospital: **17.2** days

ISS: **14.6** points

◆ TR-DGU 2012:

LOS in hospital: 17.0 days

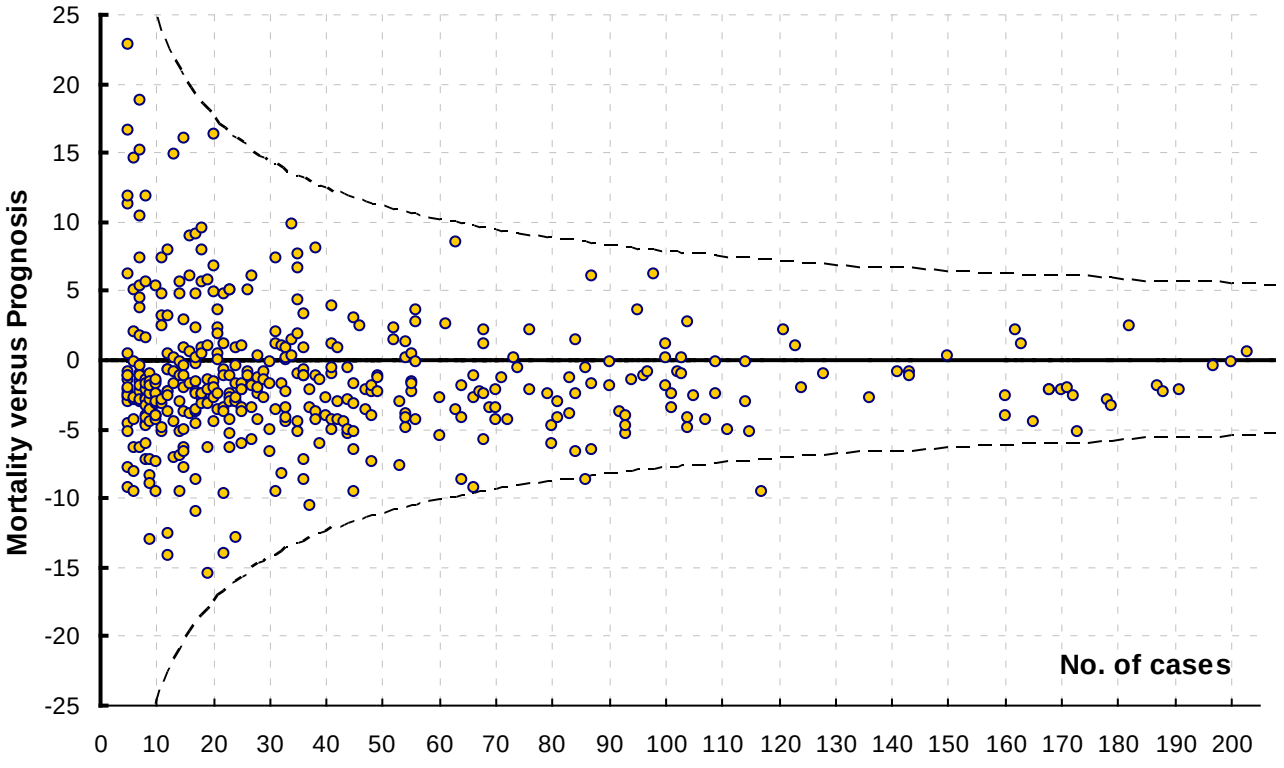
ISS: 15.0 points



Mortality and Prognosis

The following figure compares each hospital's **observed mortality rate** with the respective **RISC prognosis** in 2012, like on page 1. The difference of observed and expected mortality rate is plotted against the number of patients it is based on. Negative values correspond to mortality rates which are lower than the prognosis. The dotted lines represent the 95% confidence interval. Only primary admitted cases without early transfers with a valid RISC prognosis are considered. Hospitals with **less than 5 patients** were **not included** in this figure, due to the large statistical uncertainty.

Your Hospital 2012: No. of cases: **21.523 patients** with RISC prognosis (excluding transfers)
Mortality: **9.9%** RISC prognosis: **11.7%** Difference: **- 1.8%** (TR-DGU: -1.8%)



6. Basic Data

On the following three pages basic data from five different areas are presented: Demographics/Accident (S); Pre-hospital Phase (A); Emergency Room (B); Intensive Care (C) and Final Assessment / Discharge (D). Your hospital data refer to the year 2012. Comparative registry data are provided from the same year (**TR-DGU 2012**) and from the last 10 years 2003-12 (**TR-DGU 10**).

	Your Hospital 2012		**TR-DGU 2012**		**TR-DGU 10**	
Number of patients	**28,805**		**28,805**		**108,986**	

(S) Demographics / Accident

Primary Admissions / Transfers	%	n	%	n	%	n
primary admitted	**91.6**	26,377	**91.6**	26,377	**89.1**	97,101
among these transferred out within 48h	***6.6***	*1,887*	***6.6***	*1,887*	***5.3***	*5,760*
transferred in within 24h after trauma	**7.5**	2,161	**7.5**	2,161	**9.7**	10,558
transferred in later	**0.9**	267	**0.9**	267	**1.2**	1,332
Patient Characteristics						
Age in years (M ± SD, n)	**47.6** ± 22.2	28,750	**47.6** ± 22.2	28,750	**45.9** ± 21.9	108,479
Children/Adolescents (<16y.) (%, n)	**4.9**	1,418	**4.9**	1,418	**5.2**	5,633
Males (%, n)	**70.2**	20,217	**70.2**	20,217	**71.0**	77,365
ASA 3-4 prior to trauma * (%, n)	**13.7**	3,410	**13.7**	3,410	**13.1**	8,883
Mechanism of Injury	%	n	%	n	%	n
blunt	**94.9**	25,741	**94.9**	25,741	**95.1**	98,669
penetrating	**5.1**	1,391	**5.1**	1,391	**4.9**	5,096
Type and Cause of Accident	%	n	%	n	%	n
Traffic – car	**25.4**	6,677	**25.4**	6,677	**26.4**	26,840
Traffic – motor bike	**13.1**	3,460	**13.1**	3,460	**13.6**	13,837
Traffic – bicycle	**9.2**	2,428	**9.2**	2,428	**8.6**	8,702
Traffic – pedestrian	**7.0**	1,845	**7.0**	1,845	**7.3**	7,419
High fall (>3m)	**16.0**	4,198	**16.0**	4,198	**16.5**	16,752
Low fall	**22.1**	5,822	**22.1**	5,822	**18.4**	18,706
Suicide (suspected)	**4.5**	1,231	**4.5**	1,231	**4.7**	4,963
Assault (suspected)	**2.5**	695	**2.5**	695	**2.5**	2,652

(A) Pre-hospital Phase

Results only for **primary admitted** cases	**26,377**		**26,377**		**97,101**	
Vital Signs	**M** ± SD	n	**M** ± SD	n	**M** ± SD	n
Systolic blood pressure sBP [mm Hg]	**129** ± 33	23,300	**129** ± 33	23,300	**125** ± 33	85,189
Respiratory rate RR [/min]	**15.4** ± 5.7	16,226	**15.4** ± 5.7	16,226	**15.5** ± 6.0	58,022
Glasgow Coma Scale (GCS)	**12.6** ± 3.9	24,575	**12.6** ± 3.9	24,575	**12.1** ± 4.2	90,670
Findings	%	n	%	n	%	n
Shock (sBP ≤ 90 mmHg)	**10.3**	2,394	**10.3**	2,394	**13.4**	11,377
Unconscious (GCS ≤ 8)	**16.6**	4,074	**16.6**	4,074	**20.7**	18,787
NACA Index	%	n	%	n	%	n
at least grade IV („life threatening“)	**80.2**	7,537	**80.2**	7,537	**84.0**	39,505
Therapy	%	n	%	n	%	n
Cardio-pulmonary resuscitation (CPR)	**2.7**	696	**2.7**	696	**2.9**	2,768
Intubation	**23.2**	5,991	**23.2**	5,991	**32.6**	30,948
Volume administration	**81.9**	21,157	**81.9**	21,157	**84.5**	80,246
Chest tube ***	**2.9**	335	**2.9**	335	**4.1**	2,400
Analgo-sedation ***	**62.6**	7,317	**62.6**	7,317	**69.8**	41,021
Volume Administration	**M** ± SD	n	**M** ± SD	n	**M** ± SD	n
Average amount in all patients (ml)	**698** ± 609	25,823	**698** ± 609	25,823	**874** ± 776	94,931
Crystalloids (ml) **	**749** ± 437	20,781	**749** ± 437	20,781	**830** ± 522	78,429
Colloids (ml) **	**594** ± 310	3,665	**594** ± 310	3,665	**665** ± 369	24,173
Hypertone / hyperosmolar fluids (ml) **	**364** ± 211	763	**364** ± 211	763	**350** ± 224	5,039

* available since 2009 only M ± SD = mean and standard deviation; NACA = National Advisory Committee for Aeronautics
** average amount per patient if given
*** not available in the reduced QM dataset

	Your hospital 2012	TR-DGU 2012	TR-DGU 10
Total no. of patients	**28,805**	28,805	108,986

(B) Emergency Room

Results only for **primary admitted** cases	**n = 26,377**		**n = 26,377**		**n = 97,101**	
Transportation to hospital	**%**	n	**%**	n	**%**	n
with helicopter	**19.5%**	4971	**19.5%**	4,971	**25.8%**	24,167
Patients in shock	**%**	n	**%**	n	**%**	n
syst. blood pressure ≤ 90 mmHg	**8.3%**	2013	**8.3%**	2,013	**9.8%**	8,618
Glasgow Coma Scale (GCS)	**M** ± SD	n	**M** ± SD	n	**M** ± SD	n
if intubated on admission	**3.3** ± 1.4	3317	**3.3** ± 1.4	3,317	**3.3** ± 1.4	21,264
if intubated in the ER	**11.5** ± 4.0	1302	**11.5** ± 4.0	1,302	**12.3** ± 3.7	8,106
if not intubated	**14.2** ± 1.7	6729	**14.2** ± 1.7	6,729	**14.2** ± 1.8	25,533
Initial diagnostics	**%**	n	**%**	n	**%**	n
Sonography (FAST)	**80.7%**	21157	**80.7%**	21,157	**81.1%**	77,802
X-ray of thorax	**43.9%**	11506	**43.9%**	11,506	**51.5%**	49,445
Cranial CT (isolated or WBCT)	**85.1%**	22454	**85.1%**	22,454	**84.3%**	81,815
Whole-body CT	**71.0%**	18593	**71.0%**	18,593	**64.5%**	61,936
ER diagnostic not completed *	**3.9%**	465	**3.9%**	465	**2.7%**	1,496
Time in the ER *	**M** ± SD	n	**M** ± SD	n	**M** ± SD	n
if diagnostics not completed [min] *	**47** ± 43	398	**47** ± 43	398	**41** ± 35	1,656
if send to the operation room [min] *	**68** ± 45	3014	**68** ± 45	3,014	**72** ± 45	16,211
if transferred to the ICU [min] *	**68** ± 46	5127	**68** ± 46	5,127	**72** ± 45	21,525
Treatment in the ER	**%**	n	**%**	n	**%**	n
Ccardio-pulmonary resuscitation (CPR) *	**3.1%**	371	**3.1%**	371	**3.4%**	2,068
Chest drain *	**11.0%**	1321	**11.0%**	1,321	**13.6%**	8,244
External fracture stabilisation *	**7.8%**	935	**7.8%**	935	**7.2%**	4,366
Blood transfusion	**8.5%**	2249	**8.5%**	2,249	**13.0%**	12,626
Hemostasis treatment *	**10.3%**	1149	**10.3%**	1,149	**8.8%**	4,150
Initial laboratory values	**M** ± SD	n	**M** ± SD	n	**M** ± SD	n
Base excess [mmol/l]	**- 1.9** ± 4.5	17432	**- 1.9** ± 4.5	17,432	**- 2.3** ± 4.7	52,257
Hemoglobine [g/dl]	**13.1** ± 2.3	24820	**13.1** ± 2.3	24,820	**12.7** ± 2.6	89,246
Quick's value (PT) [%]	**87** ± 21	23113	**87** ± 21	23,113	**85** ± 22	82,484
INR **	**1.17** ± 0.49	23503	**1.17** ± 0.49	23,503	**1.19** ± 0.53	83,614
PTT [sec] *	**31** ± 16	10375	**31** ± 16	10,375	**32** ± 17	44,677
Temperature [°C] *	**36.2** ± 1.1	5562	**36.2** ± 1.1	5,562	**36.1** ± 1.2	23,554

(C) Intensive Care Unit

Patients with Intensive Care Therapy	**n = 22,507 (78.1%)**		**n = 22,507 (78.1%)**		**88,470 (81.2%)**	
Severity	**M** ± SD	n	**M** ± SD	n	**M** ± SD	n
SAPS II Score on admission *	**26.3** ± 16.9	7191	**26.3** ± 16.9	7,191	**26.5** ± 16.6	32,395
Therapy *	**%**	n	**%**	n	**%**	n
Hämostasis treatment *	**14.4%**	1535	**14.4%**	1,535	**12.9%**	6,141
Dialysis / Hemofiltration *	**2.7%**	279	**2.7%**	279	**2.6%**	1,391
Blood transfusion * within the first 48 h after admission	**25.1%**	2905	**25.1%**	2,905	**17.7%**	9,578
Mechan. ventilation / intubated	**44.5%**	10025	**44.5%**	10,025	**56.0%**	49,581
Complications *	**%**	n	**%**	n	**%**	n
Organ failure (OF) *	**35.4%**	3970	**35.4%**	3,970	**38.4%**	22,406
Multiple organ failure (MOV) *	**21.1%**	2372	**21.1%**	2,372	**23.2%**	13,533
Sepsis *	**5.8%**	637	**5.8%**	673	**6.9%**	4,042
Length of stay (LOS) and ventilation	**M** ± SD	n	**M** ± SD	n	**M** ± SD	n
Length of intubation [days]	**3.3** ± 7.8	22314	**3.3** ± 7.8	22,314	**4.6** ± 9.4	87,610
LOS on ICU [days]	**6.8** ± 10.3	22507	**6.8** ± 10.3	22,507	**8.3** ± 11.7	88,439

* not available in the reduced TR-QM dataset ** approximated from Quick's value if not documented

	Your hospital	TR-DGU 2012	TR-DGU 10
Total no. of patients	**28805**	28,805	108,986

(D) Discharge / Outcome

Diagnoses	**Mean**	n	**%**	n	**%**	n
Number of injuries per patient	**4.2**	28805	**4.2**	28.805	**4.4**	108,986
Operations* (see footnote)	**%**	n	**%**	n	**%**	n
Patients with surgery *	**68.6%**	8829	**68.6%**	8,829	**73.1%**	47,138
No. of procedures if operated * [Mean]	**2.5**		**2.5**		**2.7**	
Thrombo-embolic Events (MI; pulmonary embolism; DVT; stroke; etc,)	**%**	n	**%**	n	**%**	n
Patients with at least one event *	**2.7%**	335	**2.7**	335	**2.7**	1,420
Outcome (without early transfers)	**%**	n	**%**	n	**%**	n
Survivor	**90.0%**	24239	**90.0%**	24,239	**88.4%**	91,286
Hospital mortality	**10.0%**	2679	**10.0%**	2,679	**11.6%**	11,940
Died within 30 days	**9.6%**	2573	**9.6%**	2,573	**11.1%**	11,458
Died within 24 hours	**4.7%**	1258	**4.7%**	1,258	**5.9%**	6,119
Transfer / Discharge (all patients)	**%**	n	**%**	n	**%**	n
Survivor who were discharged and …		26126		26,126		96,769
transferred into another hospital	**15.7%**	4103	**15.7%**	4,103	**16.9%**	16,343
among them early discharges (<48h)	**7.2%**	1887	**7.2%**	1,887	**6.0%**	5,760
transferred into a rehabilitation center	**18.6%**	4867	**18.6%**	4,867	**24.3%**	23,488
sent home	**62.0%**	16207	**62.0%**	16,207	**56.1%**	54,286
Condition at the time of discharge (Glasgow Outcome Scale; GOS) (without early transfers)	**%**	n	**%**	n	**%**	n
Patients with valid GOS		25923		25,923		72,662
Surviving patients	**100%**	23244	**100%**	23,244	**100%**	63,401
– good recovery	**70.0%**	16278	**70.0%**	16,278	**62.3%**	39,502
– moderate disability	**21.8%**	5067	**21.8%**	5,067	**26.0%**	16,513
– severe disability	**6.7%**	1563	**6.7%**	1,563	**9.8%**	6,199
– persistant vegetative state	**1.4%**	336	**1.4%**	336	**1.9%**	1,187
Length of stay in hospital (without early transfers)	**MW** ± SD	n	**MW** ± SD	n	**MW** ± SD	n
All patients	**16.2** ± 18.2	26918	**16.2** ± 18.5	26,918	**19.2** ± 21.8	103,077
Only non-survivors	**7.1** ± 11.4	2679	**7.1** ± 11.4	2,679	**7.1** ± 13.5	11,935
Only survivors	**17.2** ± 18.5	24239	**17.2** ± 18.5	24,239	**20.7** ± 22.2	91,142
… if transferred into a rehab center	**29.9** ± 21.5	4867	**29.9** ± 21.5	4,867	**32.4** ± 23.9	23,470
… if transferred into another hospital	**17.5** ± 18.6	2216	**17.5** ± 18.6	2,216	**18.7** ± 19.1	10,566
… if sent home	**13.2** ± 15.3	16207	**13.2** ± 15.3	16,207	**16.0** ± 19.9	54,248
Sum of all days in hospital [days]	436,564		463,564		1,974,278	
Costs of treatment (without early transfers; see footnote)	**€**	n	**€**	n	**€**	n
Average cocts per patient						
… all patients	**14,546**	26683	**14,546**	26,683	**17,954**	101,776
… only non-survivors	**11,708**	2546	**11,708**	2,546	**12,522**	11,193
… non-survivors with ISS ≥ 16	**11,378**	2270	**11,378**	2,270	**12,401**	10,255
… only survivors	**14,846**	24137	**14,846**	24,137	**18,625**	90,583
… survivors with ISS ≥ 16	**23,573**	10472	**23,573**	10,472	**26,784**	47,046
Sum of all costs	388,140,055 €		388,140,055 €		1,827,252,259 €	
Average costs per day	**896.32 €**		**896.32 €**		**934.64 €**	

* not available in the reduced TR-QM dataset

Costs: The estimated treatment costs are based on data of 1002 German TraumaRegister patienten treated in 2007 and 2008, For these patients a detailed cost analysis was available (for details. see the TR-DGU annual report 2011).

Operations: A few annual data were disaregarded here because of assumed incompleteness of documentation.

7. Severity and Prognostic Scores

7.1 ISS, NISS, RISC, TRISS

The TraumaRegister DGU® uses the Revised Injury Severity Classification (**RISC**) Score for outcome adjustment. It has been developed and validated with data from the registry. Therefore, prediction of outcome is possible more precisely than with the classical **TRISS**.

The figure on the right side shows how the **RISC** is calculated. Starting with a constant value of 5.0 certain points (called „coefficients“ in the figue) were subtracted for each patient, depneding on the patient's values. For values outside the indicated range (e.g., age < 55 years) no points will be subtracted. The final score value **X** will then be transformed into a probability for survival using the logistic function:

$$P = 1 / [\,1 + \exp(-X)\,]$$

A score value of **X** = 0 corresponds to a 50% probablitiy of survival, while positive and negative scores indicate a higher or lower probability, respectively.

In many patients, one or more data used for calculating the RISC are missing. In order not to exclude these cases from calculation of prognosis, substitute valiables were used to impute these missing values for nearly all RISC components. But there are two exceptions where no RISC will be calculated:

1. no AIS injury codes available, and
2. more than half of the required data are missing.

For details of development, validation and calculation of the RISC, see: R. Lefering: Development and validation of the Revised Injury Severity Classification (RISC) score for severely injured patients. *Europ J Trauma Emerg Surg* 2009. 35: 437-47.

Parameter	Value	Coefficient
Age	55 - 64	- 1,0
	65 - 74	- 2,0
	ab 75	- 2,3
New ISS	Score	- 0,03
AIS Head	4	- 0,5
	5/6	- 1,8
AIS Extremities	5	- 1,0
Glasgow Coma Scale	3-5	- 0,9
Coagulation (PTT)	40-49	- 0,8
	50-79	- 1,0
	ab 80	- 1,2
Base Excess	-9 bis -19,9	- 0,8
	≤ -20	- 2,7
Cardiac arrest	ja	- 2,5
Indirect Signs of Bleeding	1	- 0,4
BP < 90 / Hb < 9.0 / RBC units > 9	2	- 0,8
	3	- 1,6
Constant	. . .	5,0

Besides the well-known **Injury Severity Score** (**ISS)** which only considers the worst injury in each of the three worst affected body regions, we also use the **New ISS** (**NISS**) which considers the three worst injuries regardless of their location (See: Osler et al. *J Trauma* 1997, 43: 922-25).

Since the documentation of injuries is compulsory for all cases, the ISS is available for all patients (no missings).

			Your hospital		TR-DGU	
			2012	**10 years**	**2012**	**10 years**
		all patients	n=28,805	n=108,986	n=28,805	n=108,986
Injury Severity Score						
ISS	Patients with ISS ≥ 16	%	**48%**	**57%**	**48%**	**57%**
	Patients with ISS below 9	%	**25%**	**19%**	**25%**	**19%**
	ISS	mean	**17.0**	**19.3**	**17.0**	**19.3**
	Survivor / non-survivor	mean / mean	15.3 / 33.2	17.4 / 34.7	15.3 / 33.2	17.4 / 34.7
	Primary cases / transfers	mean / mean	16.6 / 21.3	18.9 / 22.2	16.6 / 21.3	18.9 / 22.2
New ISS	Patients with NISS ≥ 16	%	**60%**	**67%**	**60%**	**67%**
	Patients with NISS below 9	%	**21%**	**15%**	**21%**	**15%**
	NISS	mean	**21.4**	**24.1**	**21.4**	**24.1**
	Survivor / non-survivor	mean / mean	19.2 / 42.6	21.6 / 44.2	19.2 / 42.6	21.6 / 44.2
	Primary cases / transfers	mean / mean	20.9 / 27.3	23.6 / 28.2	20.9 / 27.3	22.3 / 28.7
Prognostic Scores RISC and TRISS						
	Only primary admitted cases without early transfers		n=24,490	n=91,341	n=24,490	n=91,341
RISC	all data for RISC available	n/%	6,310 / **26%**	23,130 / **25%**	6,310 / **26%**	23,130 / **25%**
	RISC available after imputation	n/%	21,523 / **88%**	79,769 / **87%**	21,523 / **88%**	79,769 / **87%**
	No. of deaths in this group	n	2,140	9,290	2,140	9,290
	Mortality	%	**9.9%**	**11.6%**	**9.9%**	**11.6%**
	RISC prognosis	%	**11.7%**	**13.4%**	**11.7%**	**13.4%**
TRISS	all data for TRISS available	n/%	13813 / **56%**	50356 / **55%**	13,813 / **56%**	50.356 / **55%**
	No. of deaths in this group	n	1,237	5,480	1,237	5,480
	Mortality	%	**9.0%**	**10.9%**	**9.0%**	**10.9%**
	TRISS prognosis	%	**10.8%**	**13.4%**	**10.8%**	**13.4%**
For comparison: **RISC** prognosis in this patient group		%	**10.8%**	**12.8%**	**10.8%**	**12.8%**

7.2 The new RISC II

The **Revised Injury Severity Classification (RISC)** score has clear prognostic advantages over the classical TRISS but it has also some limitations:

- the data base for the original RISC is somewhat outdated (1993-2000),
- therefore, the prognosis is actually 1-2% higher than the observed mortality,
- the RISC needs ralatively many variables which leads to problems with missing values,
- the algorithm for replacement (imutation) of missing variables is komplex,
- the percentage of patients without a valid prognosis (in spite of replacement) is below 90%,
- and some new prognostic factors were not yet included (underlying diseases, pupils).

Therefore an update of the present <RISC score has been developed, the **RISC II**. It was the aim of this update to make the score

→ easier to use,,
→ more up-to-date,
→ and better.

The update is based on about 30.000 patients from the years 2010 and 2011 documented in the TraumaRegister DGU®. Patients from the year 2012 served for validation purposes. Although the development process has not yet been completed you wqill find first preleminary results here in this report. In the next year the new **RISC II** will then replace the RISC in the annual report.

The main improvement of the new **RISC II** is the treatment of **missing data**. Instead of trying to replace (impute) the missing values, they will be included in the model. What does this mean?

RISC II

Variable	Value	Coefficient
Constant		+ 3,7
Worst injury	AIS 3	- 0,5
	AIS 4	- 1,2
	AIS 5	- 1,7
	AIS 6	- 2,9
Second worst injury	AIS 0-2	+ 0,2
	AIS 3	0
	AIS 4	- 0,6
	AIS 5	- 1,4
Head injury	AIS 0-2	0
	AIS 3/4	- 0,1
	AIS 5/6	- 0,7
Age	1-5	+ 1,1
	6-10	+ 0,6
	11-54	0
	55-59	- 0,5
	60-64	- 0,8
	65-69	- 0,9
	70-74	- 1,2
	75-79	- 1,9
	80-84	- 2,4
	85+	- 2,7
Pupil reactivity	brisk	+ 0,2
	sluggish/???	0
	fixed	- 0,9
Pupil size	normal	+ 0,4
	anisocoric/???	0
	bilat. dilated	- 0,5

Variable	Value	Coefficient
Sex	female	+ 0,2
	male / ???	0
ASA pre-trauma	1-2	+ 0,4
	3 / ???	0
	4	- 1,2
Mechanism	blunt / ???	0
	penetrating	- 0,7
GCS motor function	normal	+ 0,4
	directed / ???	0
	non-directed	- 0,3
	none	- 0,7
Systolic BP on admission	< 90	- 0,6
	90-110 / ???	0
	111-150	+ 0,3
	> 150	0
CPR	nein / ???	0
	ja	- 1,6
Coagulation: INR	< 1,2	+ 0,6
	1,2 - 1,4	+ 0,2
	1,4 - 2,4 / ???	0
	> 2,4	- 0,4
Blood: Hemoglobin	≥ 12,0	+ 0,4
	7,0-11,9 / ???	0
	<7,0	- 0,5
Acidosis: Base deficit	< 6	+0,3
	6-9 / ???	0
	9-15	- 0,4
	15+	- 1,5

For age and injury severity no missing values will be accepted since these data are considered as the backbone of any prognostic estimator. For all other variables the rule is as follows: a missing value does not change the prognosis (the coefficient for ??? = 0). If a value is available, and it is in the normal range, the prognosis will improve (positive coefficient), while it will worsen in case of a critical finding. Thus, the more data are documented, the more precise the prognosis will be. The following new predicor variables are included in the RISC II: sex, mechanism of injury, pre-existing diseases (ASA), pupil reactivity, and pupil size. Because of their considerable prognostic importance pupil reactivity and pupil size will be included in the reduced QM dataset in near future.

In total thirteen different **variables** are used for the RISC II (where the three items for injury severity are considered as one variable). The average number of available variables is thus a good indicator for data quality.

In summary, the new **RISC II** score is …

→ **easier to use:** no complicated replacement procedures required
→ **up-to-date:** the prognosis is based on data from 2010/11
→ and **better:** comparisons of ROC curves show a signifikant improvement, and it could be calculated for all patients.

Here are the first results of the **RISC II**

only primary admitted cases, without early transfers			Your hospital 2012 n=24490	Your hospital 10 years n=91341	TR-DGU 2012 n=24,490	TR-DGU 10 years n=91,341
RISC II	der scorecould be calculated for	n/%	24473 / **100%**	91216 / **100%**	24,473 / **100%**	91,216 / **100%**
	Avg. number of available variables*	mean	10.0	10.2	10.0	10.2
	Verstorbene Patienten	n	2418	10616	2.418	10.616
	Mortality	%	**9.9%**	**11.6%**	**9.9%**	**11.6%**
	RISC II Prognosis	%	**9.7%**	**12.1%**	**9.7%**	**12.1%**

* max. 13 in the standard dataset / 11 in the reduced QM dataset

8. Data Quality and Completeness

Registries and audit reports could only be as good as the data they are based on. If a lot of patients have missing data in important variables needed, for example, for prognostic scores, then these patients have to be excluded from analysis. The following table describes the **completeness rates (%)** of several important variables, together with the **number of patients with missing data (∅)**. The list also contains a short description of the importance of these variables.

Good completeness rates are indicated with green color (96% or better), variables with moderate completeness are marked in yellow (completeness 90-95%), and insufficient completeness (below 90%) is indicated in red. The categories for completeness are targets defined by the TraumaRegister DGU®, they are not derived from the data.

The completeness rates of your hospital **in 2012** are compared with your hospital's data from the previous years (**since 2003**) and with actual overall data from the whole registry (**TR-DGU 2012**). Besides the rates also the number of patients with missing data is given, marked with the ∅ sign, including also cases with implausible data.

Variable	Importance	Category (%)			Your hospital 2012	Your hospital 2003-11	TR-DGU 2012
Pre-clinical data (A)							
				only primary admitted cases	n=26,377	n=70,724	n=26,377
GCS	Required for TRISS and RISC, also needed to define cases for two audit filters	96+	90-95	<90	**93%** ∅ 1,802	**94%** ∅ 4,629	**93%** ∅ 1,802
Syst. blood pressure	Required for TRISS and RISC as indirect sign of bleeding, required also for definition of shock	96+	90-95	<90	**88%** ∅ 3,077	**88%** ∅ 8,835	**88%** ∅ 3,077
CPR	Cardio-pulmonary resuscitation is seldom (3-4%) but highly predictive for outcome, required for RISC	96+	90-95	<90	**95%** ∅ 1,321	**93%** ∅ 4,883	**95%** ∅ 1,321
Respiratory rate	As part of the RTS required for TRISS (but not for RISC)	96+	90-95	<90	**62%** ∅ 10,151	**59%** ∅ 28,928	**62%** ∅ 10,151
Emergency room / surgery (B)							
				only primary admitted cases	n=26,377	n=70,724	n=26,377
Time of admission	Required to calculate the time until diagnostics were performed	96+	90-95	<90	**99%** ∅ 157	**97%** ∅ 1,968	**99%** ∅ 157
Base Excess	Base excess is part of the RISC and a independent prognostic factorr	96+	90-95	<90	**66%** ∅ 8,947	**49%** ∅ 35,902	**66%** ∅ 8,947
Coagula-tion	At least one coagulation marker (PTT, Quick, INR) is needed for the RISC	96+	90-95	<90	**90%** ∅ 2,769	**85%** ∅ 10,337	**90%** ∅ 2,570
Hemo-globin	Is part of the RISC score as an indirect bleeding sign	96+	90-95	<90	**94%** ∅ 1,557	**91%** ∅ 6,298	**94%** ∅ 1,557
Diagnoses / Outcome (D)							
				all patients	n=28,805	n=80,181	n=28,805
GOS	The Glasgow Outcome Scale (GOS) describes the patient's condition at discharge or transfer	96+	90-95	<90	**94%** ∅ 1,703	**94%** ∅ 4,938	**94%** ∅ 1,703
Severe Injuries	Patients with ISS<9 and no intensive care lie outside the scope of this registry (maybe not all injuries coded)t	96+	90-95	<90	**90%** ∅ 2,975	**93%** ∅ 5,424	**90%** ∅ 2,975
Surgical treatment	A low rate of surgical patients could be based on incomplete documenta-tion (only standard dataset, not QM)	70+	50-69	<50	**65%** 8902 / 13784	**68%** 38479 / 56599	**65%** 8902 / 13784
Process data							
				all patients	n=28,805	n=80,181	n=28,805
Time of documentat ion	Data quality correlates with the time of documentation. The average time (in months) from accident to docu-mentation in the TR-DGU is given			Case is created Case is completed	**3.5** mon. **7.0** mon.	**4.7** mon. **8.6** mon.	**3.5** mon. **7.0** mon.
Low sample size	Not for local trauma centers, A low sample size compared to the average (107 and 33, respectively, see 5.1) could be based on not documented cases	60+	40-59	<40	**120%** n=128		

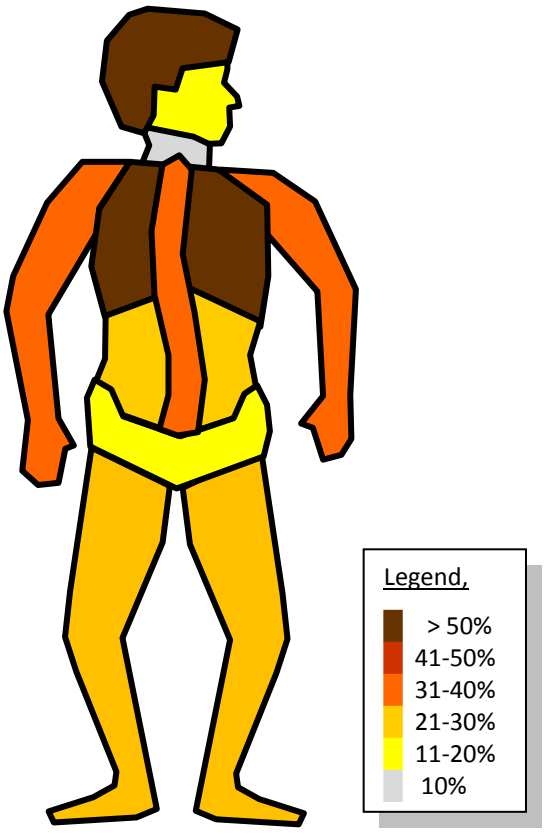
9. Pattern of Injury

The figure below shows the avarage injury pattern of your patients compared with the TraumaRegister DGU®. For these data only severly injured patients with an **ISS ≥ 16** points were considered. In order to reduce the statistical uncertainty, all patients from the last three years **(2010-2012)** were evaluated together.

Data are presented for each of the nine body regions according to the **Abbreviated Injury Scale (AIS).** The rates refer to injuries with an injury severity of **at least two points** (including, for example, radius fractures, spine fractures, lung contusions, etc.). The coloured figure refers to data from the whole registry (TR-DGU).

In the last three years **36,132 patients** (of 69,991) treated in your hospital had an ISS of at least 16 points (**51.6%**). For comparison, TR-DGU n=36,132; 51.6% with ISS ≥ 16.

Head	Your hospital	**60.6%**	(n = 21,900)
	TR-DGU	60.6%	(n = 21,900)
Face	Your hospital	**15.4%**	(n = 5,567)
	TR-DGU	15.4%	(n = 5,567)
Neck	Your hospital	**1.6%**	(n = 577)
	TR-DGU	1.6%	(n = 577)
Thorax	Your hospital	**60.4%**	(n = 21,809)
	TR-DGU	60.4%	(n = 21,809)
Abdomen	Your hospital	**22.4%**	(n = 8,088)
	TR-DGU	22.4%	(n = 8,088)
Spine	Your hospital	**33.7%**	(n = 12,183)
	TR-DGU	33.7%	(n = 12,183)
Arms	Your hospital	**33.2%**	(n = 11,981)
	TR-DGU	33.2%	(n = 11,981)
Pelvis	Your hospital	**20.2%**	(n = 7,293)
	TR-DGU	20.2%	(n = 7,293)
Legs	Your hospital	**29.7%**	(n = 10,726)
	TR-DGU	29.7%	(n = 10,726)



Injury Severity Score

The **Injury Severity Score (ISS)** is also based on the AIS codes, however, only six body regions are considered here which partly deviate from the AIS body regions (for example, spinal injuries were counted for head, thorax, or abdomen, reespectively; all soft tissue injuries constitute a separate body region, etc.). The percentage of patients with **'serious' injuries (defined as AIS ≥ 3)** in four of the six ISS body regions is given below. The prevalence of serious injuries in the remaining body regions 'face' and 'external/soft tissue' is below 7%.

These results also refer to patients with ISS ≥ 16 only, documenterd in the last three years (2010-2012).

Serious injuries (AIS ≥ 3)	**Your hospital** n = 36,132	**TR-DGU** n = 36,132
… of the **head/neck**	**54.4%** (n=19,652)	54.4% (n=19,652)
… of the **chest**	**54.2%** (n=19,601)	54.2% (n=19,601)
… of the **abdomen**	**16.2%** (n=5,859)	16.2% (n=5,859)
… of the **extremities/pelvic girdle**	**31.3%** (n=11,293)	31.3% (n=11,293)

10. General Results

Some results of the actual analysis of 2012 data from the TraumaRegister DGU® are of general interest. They will be presented here without reference to individual hospitals' results.

10.1 Hospitals and Patients

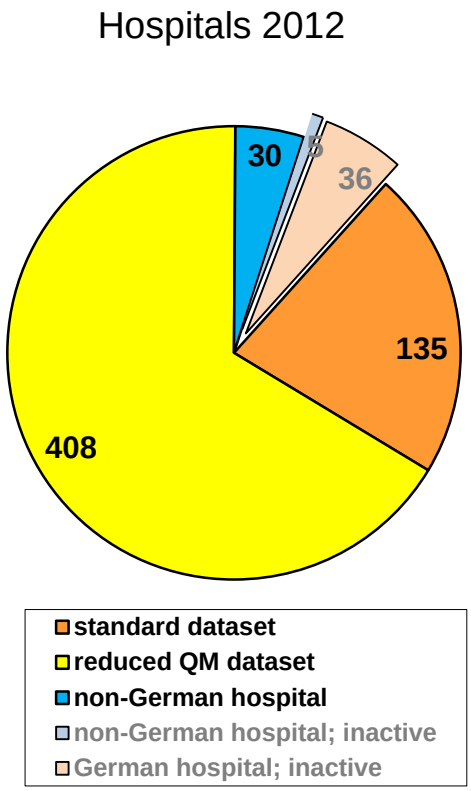
Hospitals

In 2012 data of **28,805** patients from **573** actively participating hospitals have been documented in the TraumaRegister DGU®. Thus the total number of patients documented since 1993 rose to **122,742** cases.

The total number of hospitals ever having participated in the registry was 614. Among them were 35 hospitals from outside Germany; 30 of them submitted data last year: Austria 16, Slovenia 5, the Netherlands 4, Switzerland 4, Luxembourg 2, Finland 1, Belgium 1, United Arab Emirates 1, and China 1. From German 543 hospitals actively participated in 2012.

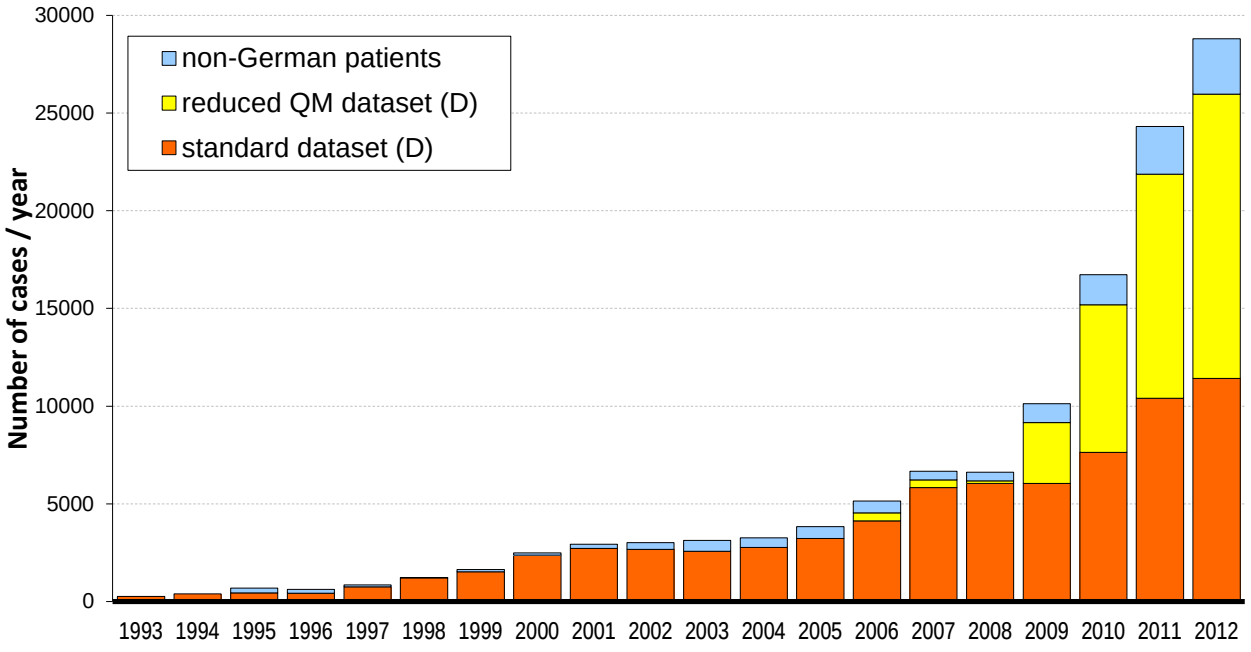
The figure on the right shows the distribution of hospitals. For German hospitals it is also indicated how many hospitals used the standard documentation sheet or the reduced version. The reduced version (QM dataset) is available only for certified hospitals in German trauma networks (TraumaNetzwerk DGU®).

This reduced version is mainly used by local (level 3; 92%) or regional (level 2; 83%) trauma centers. The majority of level 1 trauma centers is using the standard documentation sheet (60%).



Patients

The figure below demonstrates the continuous increase in the annual number of patients documented in the registry. The percentage of non-German patients actually is 10%. Only 9% of patients have been documented before 2002 when the online documentation started. Last year, about half of all patients (48%) have been documented with the standard dataset.



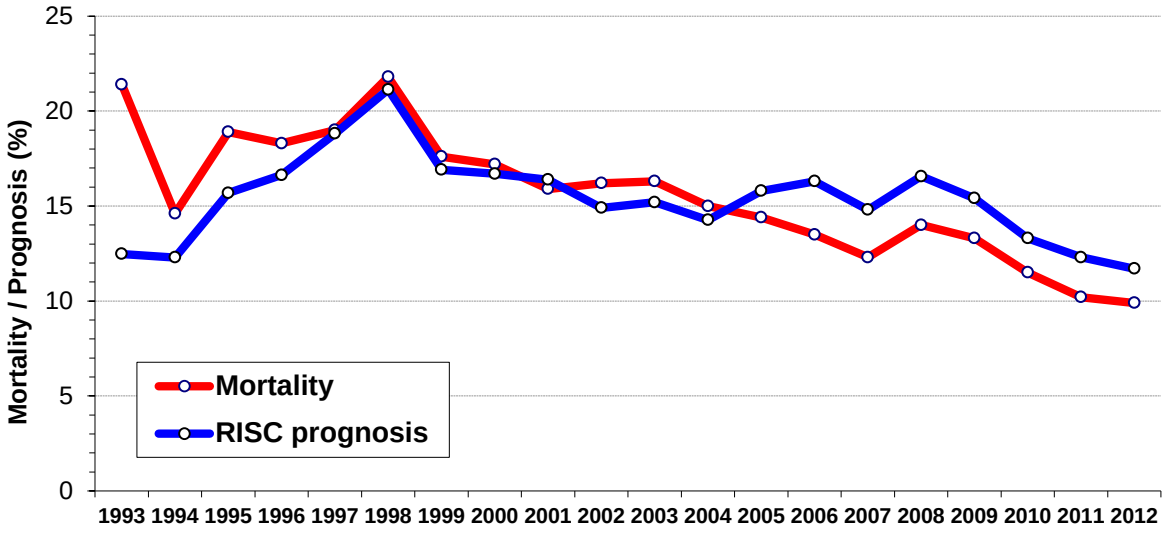
10.2 Outcome and Prognosis over Time

Since 2003 the TraumaRegister DGU® uses the **RISC** (Revised Injury Severity Classification) score for estimating the patients' prognosis. The RISC has been developed with registry data from the years 1993-2000. Subsequently it has repeatedly been validated (Lefering; *Europ. J. Trauma* 2009).

The following results only include primary admitted patients (no transfers in; no early transfers out) who had sufficient data for calculating the RISC. In 12.1% of primary admitted patients there were not enough data for calculating a RISC prognosis.

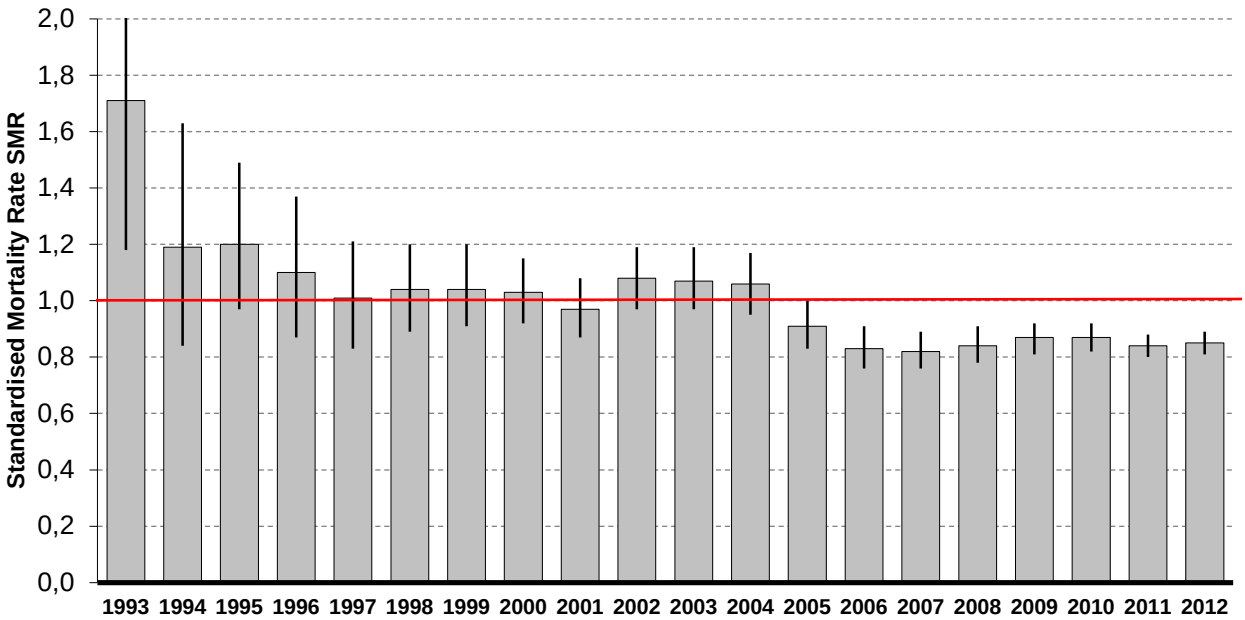
Until the middle of the last decade the RISC has been a precise tool for outcome prediction; observed and predicted mortality were closely related. However, in the recent years there was a tendency regarding lower mortality which led to a slight over-estimation of the predicted mortality. In 2012 the predicted mortality was 11.7% (RISC prognosis) while only 9.9% of cases actually died.

The new **RISC II** score calculated in the same patient group (primary cases in 2012) resulted in a 9.8% expected mortality rate which is much closer to the observed value. Furthermore, future applications of the RISC II will also include all patients with missing data excluded here.



The relation of observed and expected mortality could also be demonstrated with the Standardized Mortality Ratio (**SMR**). Since 2005 the SMR significantly lies below the level of 1 (red line) which indicates a better than expected outcome. The vertical line given for each bar represents the 95% confidence interval (95% CI). The deviation from 1 is significant if this value lies outside the 95% CI.

In 2012 the SMR was found to be **0.85** (95% CI: 0.81 – 0.89).



10.3 Revision of the Dataset

The TraumaRegister DGU® regularly updates its dataset. This has been done every 3-4 years in the past, and it will also be necessary in future. During the revision each variable is checked for completeness, importance, reliability and actual use.

But it is also checked whether the actual dataset is appropriate to answer important questions in trauma care. In this respect it could also be necessary to introduce new variables, for example, to better describe the process of coagulation management. Every extension of the dataset, however, is critically discussed since the overall effort for data collection should not be extended. Therefore, deleting variables from the dataset also belongs to the process of revision.

The following table gives a short description of what has been agreed on after extensive discussions by the TraumaRegister Working Group of NIS. These changes will be implemented by the end of 2013.

The following data items will be NEW in the dataset:

Phase	Area	Variable	Remark
S	ASA	Pre-existing coagulopathy	Aging population; important to evaluate the hemostatic treatment
A	Vital signs	Capnometria*	Important to check correct intubation
A	Interventions	Alternative airway*	Alternative to endotracheal intubation
A+B	Interventions	Pelvic binder	Evaluation of frequency and benefit
A+B	GCS	Pupil size* and reactivity*	High prognostic relevance; easy to measure; part oft the new RISC II
B	Lab values	Alcohol	Prevalence; prognostic relevance
B+C	Lab values	Fibrinogen; Ca++; Rotem: additional findings (only B)	Evaluation of hemostatic treatment
B+C	Hemostatic treatment	Factor XIII; Tranexamic acid (also A) Ca substitution	Update of actual medications
B	Therapy	Time point of first blood transfusion Time point of hemostatic therapy	Allows severity stratification; potential marker for process quality
B	Diagnostics	MRT	Inceasing importance and use
B	Emergency interventions	Multiple interventions (each with time point) could be documented*	Sequence of intervention allows a better description of the process
C	Sepsis	If yes, what is the source	Description oft the type / reason
D	Outcome	Reason of death; Patient's refusal of further treatment	Only required in non-survivors

* refers also to the reduced QM dataset

The following variables were DELETED from the dataset:

Phase	Area	Variable	Remark
A	GCS	right/left pupil reaction and size	Not important
B	Time in the ER	ER diagnostic completed before admitted to ICU	Unclear definition; not adequate
B+C	Lab values	Lactate	High rate of missings; BE preferred
B+C	Hemostatics	Factor VIIa; anti-fibrinolytics	Deleted or replaced
C	SAPS II	SAPS II	Seldom used; high workload
D	Outcome	DRG-code; Aufwandpunkte	Seldom used; many missing values

Furthermore, some items will be defined more precisely. For example, the stay on an intermediate care unit will not be counted as ‚days on ICU'. We also added the option ‚send to another hospital' as a new ER discharge destination. 'Other traffic' could now be described in a separate text field like train, quad etc.

More information regarding the new version of the dataset will be available on the homepage of the TraumaRegister DGU® when it is introduced (see www.traumaregister.de).

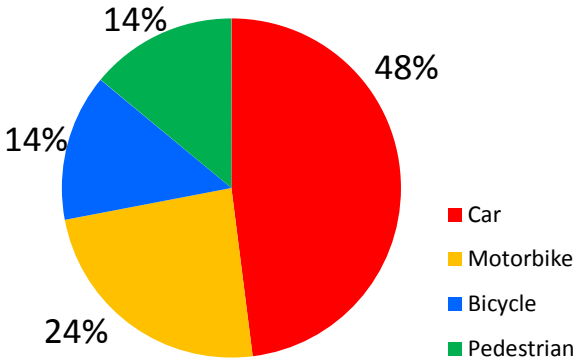
10.4 Actual Results

This page presents results from actual analyses of the TraumaRegister DGU®.

Traffic-related injuries

Traffic-related injuries are responsible for about 60% of all trauma admissions in the registry. Although the TraumaRegister DGU® does not include pre-hospital deaths as well as patients with minor injuries a lot of epidemiological findings could be derived from the data.

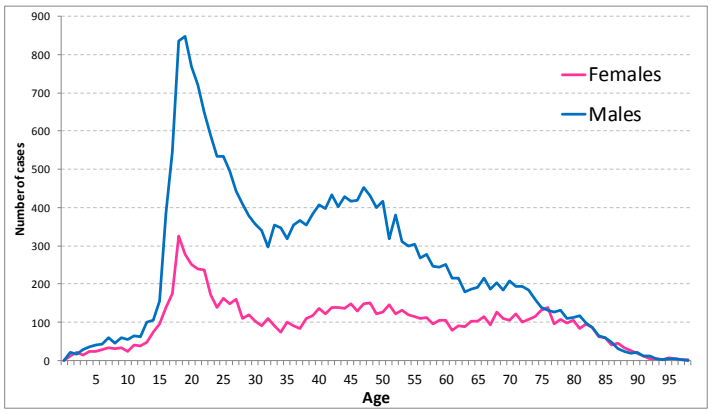
The figure on the right shows the relative frequency of different types of traffic-related trauma. These figures are based on data from 34,059 patients with ISS ≥ 9 and intensive care documented in 2002-2011.



Age and sex

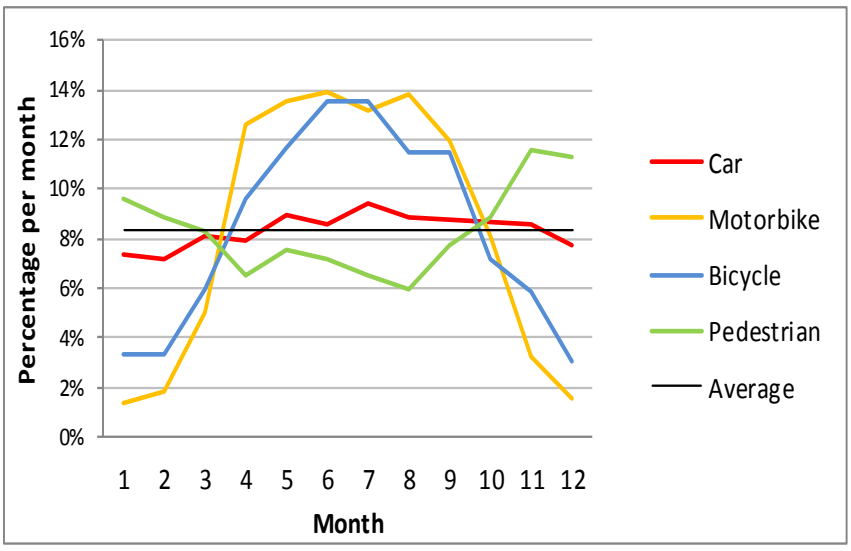
With an average age of 38 years, victims of car and motorbike accidents are clearly younger than pedestrian (49 years) and bicycle riders (51 years). While motorbike riders are mostly males (90%) the largest portion of female patients is found among pedestrians (42%).

The figure on the right shows the age distribution for both, men and women, for all types of traffic-related injuries. Already at the age of three years there are more boys than girls among the victims. Then, for a considerable range of ages there are about three times more males than females. Only in the age groups of 75 years and above there are about equal numbers of men and women.



Season

Traffic-related injuries do not occur equally during the year. In summertime (June – August) the number of victims is about twice as high as in wintertime.



The seasonal variations do not occur equally for all types of traffic-related injuries. The figure on the left shows for each type of injury the relative frequencies in each month. If a certain type of injury would occur independently from the season one would expect about 1/12 of all accidents per month (8,3%, average). This is approximately true for car accidents. However, accidents with pedestrians are more frequent in the dark season, while motorbike and bicycle riders clearly have a peak in summer.

These results have been presented at a symposium organized by ADAC (German Automobile Club) and BASt (Federal Highway Research Institute) in October 2012 in Baden-Baden.

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Imprint

Statistical analyses and preparation of the annual audit reports:

Rolf Lefering (IFOM) in cooperation with **Ulrike Nienaber** (AUC)

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Financial disclosure

The **TraumaRegister DGU®** receives fees from the participating hospitals collected by the AUC GmbH. The AUC GmbH which is a 100% affiliate of the DGU (Deutsche Gesellschaft für Unfallchirurgie), also hosts the registry and is owner of the database. Hospitals certified as members of a trauma network (TraumaNetzwerk DGU®) are obliged to participate in the TraumaRegister DGU®, all other hospitals participate voluntary.

In the past the registry received financial or other support from the following organizations and companies:

- Private University Witten/Herdecke gGmbH (2005-2013)
- Novo Nordisk A/S, Bagsværd, Denmark (2003-2009)
- Sanofi Aventis Deutschland GmbH (2008)
- Deutsche Forschungsgemeinschaft - DFG (1996-2003)
- Hauptverband der Berufsgenossenschaften - HVBG (2004)

Publications from the TraumaRegister DGU®

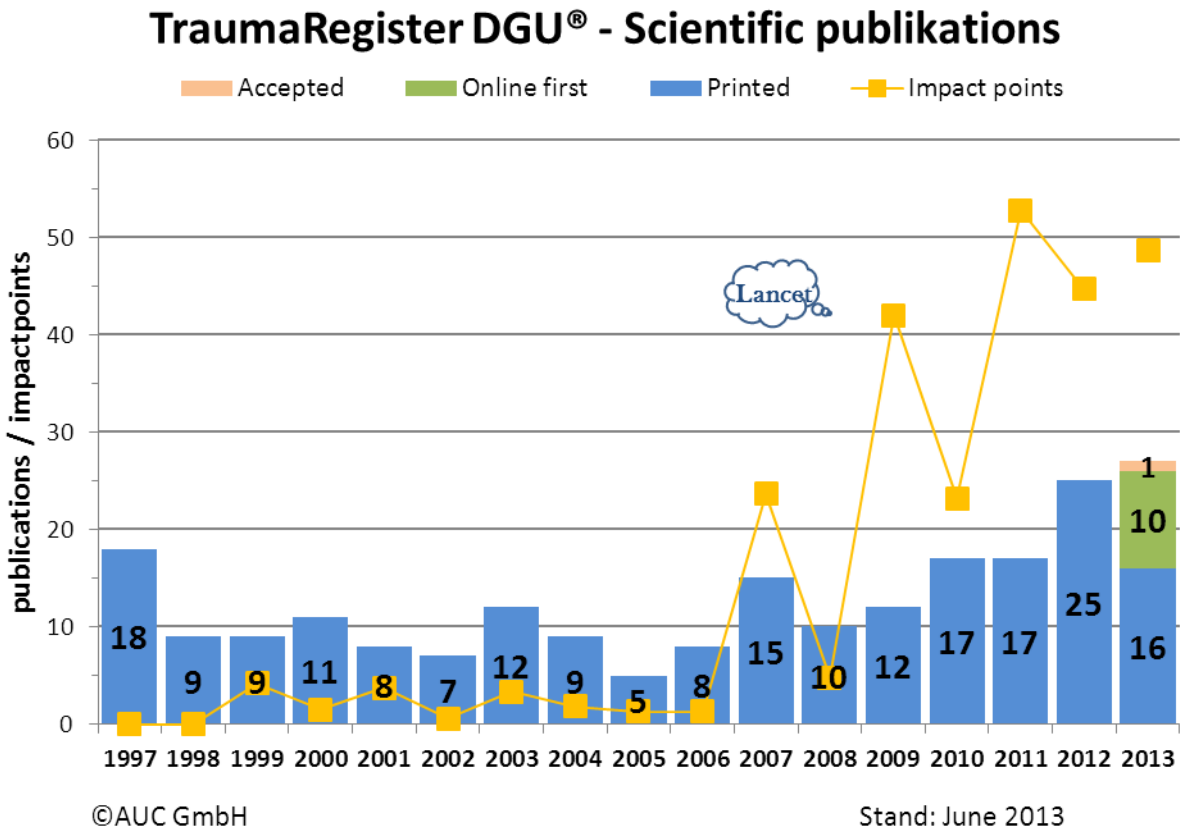
Publications from the last three years (2011-2013), no abstracts; last update: July 2013

An extended list of publications from the TraumaRegister DGU® including also papers published before 2011 is available on **www.traumaregister.de**.

[PDF] / [PDFprov] = this paper is available in PDF format / provisional PDF format.

The articles indicated with **[PDF]** could be provided to interested users on request if there is no direct access to the respective journal. In this case, please send an email to: traumaregister@auc-online.de .

The following figure presents the **number** of publications from the TraumaRegister DGU® since 1997 as well as the sum of **impact points** reached with these papers.



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List of abbreviations used in the report

Abbreviations

AIS	Abbreviated Injury Scale
ASA	American Society of Anaesthesiologists
AUC	AUC – Academy of Trauma Surgery (Akademie der Unfallchieurgie GmbH)
BE	Base Excess
CT	Computed tomography
CCT	Cranial computed tomography
DGU	German Trauma Society (Deutsche Gesellschaft für Unfallchirurgie)
EK	Unit of packed red blood cells (pRBC)
FFP	Fresh Frozen Plasma
GCS	Glasgow Coma Scale
GOS	Glasgow Outcome Scale
h	Hour
Hb	Hemoglobin
INR	International Normalized Ratio
ISS	Injury Severity Score
min	Minute
ml	Milliliter
MOF	Multiple Organ Failure
NACA	National Advisory Committee for Aeronautics (präklin. Score)
NIS	Committee on Emergency Medicine, Intensive Care and Trauma Management of the German Trauma Society (Sektion NIS)
NISS	New Injury Severity Score
OP	Operation
OF	Organ Failure
PDF	Portable Document Format
PTT	Partial thromboplastin time (in sec)
QM	Quality management
RISC	Revised Injury Severity Score (prognostic score)
sBP	Systolic blood pressure
RTS	Revised Trauma Score
SAPS	Simplified Acute Physiology Score
sec	Second
SD	Standard deviation
TBI	Traumatic brain injury
SMR	Standardized Mortality Ratio
SOFA	Sequential Organ Failure Assessment
TPZ	Thromboplastin timet; Quick's value
TR-DGU	TraumaRegister DGU®
TRISS	Trauma and Injury Severity Score (prognostic score)